

Early College High School Initiative

Rigor Plus Support: *How Science Teachers Use Literacy Techniques to Get Students Ready for College*

by Katie Bayerl

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About the Early College High School Initiative

Early college high schools are small schools from which students leave with not only a high school diploma but also an Associate's degree or up to two years of college credit toward a Bachelor's degree. By changing the structure of the high school years and compressing the number of years to a college degree, early college high schools have the potential to improve graduation rates and better prepare students for entry into high-skill careers.

The Bill & Melinda Gates Foundation, along with Carnegie Corporation of New York, the Ford Foundation, and the W.K. Kellogg Foundation, is funding the Early College High School Initiative. The 13 partner organizations are creating or redesigning more than 250 pioneering small high schools. Jobs for the Future coordinates the Early College High School Initiative and provides support to the partners and to the effort as a whole.

About the Author

As project manager of the Early College High School Initiative, Katie Bayerl co-coordinates learning activities for the 14 early college high schools involved in the Kellogg-funded Literacy Network. Ms. Bayerl is also responsible for documenting promising practices in early college high schools. Prior to joining Jobs for the Future, Ms. Bayerl taught high school English and supported teachers as a literacy coach in the Boston Public Schools.



Jobs for the Future seeks to accelerate the educational and economic advancement of youth and adults struggling in today's economy. JFF partners with leaders in education, business, government, and communities around the nation to: strengthen opportunities for youth to succeed in postsecondary learning and high-skill careers; increase opportunities for low-income individuals to move into family-supporting careers; and meet the growing economic demand for knowledgeable and skilled workers.

Rigor Plus Support:

How Science Teachers Use Literacy Techniques to Get Students Ready for College

Schoolwide literacy. Academic literacy. Content-area literacy. Literacy across the curriculum. These related ideas are hot in secondary schools, and at their core, they all propose something similar: raise students' achievement by paying attention to literacy skills in every class every day.

Schoolwide literacy—the teaching of reading, writing, speaking, and thinking practices in all content areas—is generally considered an effective, even necessary, approach to addressing the learning needs of adolescents. In early college high schools, which blend high school and college for students who are underserved in higher education, the need to identify and implement effective schoolwide literacy practices is perhaps most urgent. Because many students enter early college below grade level, literacy skills development is a primary concern, as is the development of the high-level thinking skills

demanded by college. The leaders and faculty of early college high schools, then, are constantly working to develop the right mix of academic supports that make an accelerated curriculum feasible and ensure college success for every student. By focusing on a few good literacy practices in every class, these schools aim to increase rigor and support—simultaneously.

With seed funding from the W.K. Kellogg Foundation, 14 early college high schools have led the Early College High School (ECHS) Literacy Network by piloting schoolwide literacy action plans since 2004. Teams of teachers, administrators, and postsecondary partners from those 14 schools have worked with one another, staff from Jobs for the Future, and consulting faculty from the University Park Campus School in Worcester, Massachusetts, to identify what literacy strategies should be part of an early college high school.

This publication is one result of that collective work. The three science teachers highlighted here teach in ECHS Literacy Network schools. Each of them, through a mix of individual research, innovation, and the support of colleagues, has crafted an approach to addressing literacy in a science classroom. The practices they have developed—and continue to refine—not only build students' skills in reading, writing, and thinking, they also increase their understanding of science content and support their ability to think and solve problems like scientists.

The teachers featured here did not invent these methods on their own; like all good teachers, they draw on ideas and practices used by others, and—through careful reflection about the particular needs of their students and some trial and error—they have made these practices their own.

Each classroom practice featured here has been honed to a point where it is ripe for sharing. What's more, each of these methods is easily transferable to other content areas. Give these practices a try in your own classroom, adapt them to fit your students' needs, and pass your learning along to colleagues.

Note: Several of the tools and samples featured in this publication can be downloaded at www.earlycolleges.org/library.html.

Frequently Cited Reasons for Making Literacy a Schoolwide Effort

When students apply literacy strategies, they can access and understand increasingly difficult content in any subject area.

Students learn to think like scientists, historians, etc., when teachers apprentice them in the modes of writing, analysis, and discourse of each discipline.

Once students master a "toolbox" of literacy skills, they have more success in independent learning situations, including college.

English language learners, students with special needs, and students who've had uneven prior schooling can participate in a rigorous curriculum when every teacher knows and addresses their literacy needs.

The consistent use of a few literacy strategies across classes makes the learning experience more coherent for students and allows them to focus on mastering content.

As teachers share literacy strategies, they build a professional culture of collaboration where the focus is on student success.

The Interactive Notebook

One challenge in studying science is the sheer magnitude of content. A science text presents quantities of information as fact, a lab experiment produces reams of observations, a popular news article links to several, interconnected fields of scientific research. How does a student make this information her own? Even more important, how does she process the content like a scientist—probing for underlying concepts, questioning improbable results, and constructing new theories?

At Community Charter Early College High School in Los Angeles, students use an “interactive notebook” to record and process everything they learn in science.¹ The concept is relatively simple: for every “input” on the right-hand side (new content gathered through notes, labs, and research), students create a mirror “output” on the left-hand side through which they organize, process, question, and respond to the content.

Community Charter teacher Tara Renner picked up the interactive notebook strategy after a colleague had discussed its use in her niece’s middle school science class three years ago. Since then, she has tweaked her expectations, guidelines, and assessments until, finally, she feels this strategy is paying off in helping students make

science their own. Using the notebook as a tool, Community Charter students use their notes and responses as fodder for increasingly complex study of scientific concepts. No new knowledge remains static, as students try out different methods for deepening and representing their understanding of new knowledge: they constantly interact with the content covered in their course.

The interactive notebook method has been so effective that several teachers in Ms. Renner’s local charter school network and in the ECHS Literacy Network have adopted the model.

Just what makes Ms. Renner’s notebook design work?

First: Set explicit guidelines. At the start of the year, students set up their notebooks together, pasting the guidelines into the first page. They practice different types of “output” (e.g., reflections, drawings, concept maps, lists, charts) that they can use to process the “input” (e.g., notes, labs, research) from class. They also receive a rubric explaining how the notebook will be graded. Individually and as a class, students go back to the guidelines and rubric again and again until the entries meet the criteria. At that point, Ms. Renner ups the ante and introduces a more challenging rubric.

Interactive Notebook Rubric		STUDENT NAME: _____ DATE: _____		TOTAL NOTEBOOK GRADE: _____			
CATEGORY -Task	A YOUR GOAL	B	C	D	F	Your Grade	Points
NOTEBOOK ORGANIZATION 10 Points	All pages have numbers, dates & titles. It is neat and organized properly.	Missing a few page numbers, dates & titles. It is fairly neat and organized.	Missing many page numbers, dates & titles. It is fairly neat and organized.	Missing many page numbers, dates & titles. Notebook is not neat and not organized.	Missing most page numbers, dates & titles. Notebook is not neat and not organized.		
CLASSWORK -Notes/glue-ins (INPUT) 25 Points	All notes and glue-ins present. Notes are neat, detailed and accurate.	All notes and glue-ins present. Notes are not neat, detailed and/or accurate OR Missing very few but notes are neat, detailed and/or accurate.	Missing some notes and glue-ins. Notes are not neat, detailed and/or accurate.	Missing many notes and glue-ins. Notes are not neat, detailed and/or accurate.	Missing most/all notes and glue-ins. Notes are not neat, detailed and/or accurate.		
CLASSWORK -Warm-ups 35 points	All warm-ups are present. Student copies questions and answers with care, depth and accuracy.	All warm-ups are present, but student does not copy question and does not answer with care, depth and accuracy OR missing some but student copies questions and answers with care, depth and accuracy.	Missing some and student does not copy question and/or does not answers with care, depth and accuracy.	Missing many and student does not copy question and does not answers with care, depth and accuracy.	Missing most/all warm-ups and student does not copy question and does not answers with care, depth and accuracy.		
HOMEWORK -Output for notes/glue-ins, warm-ups and labs 60 points	Output is present for all work. Output is detailed, creative and shows understanding of terms and concepts.	Output is present for all work but is not detailed, creative and does not show understanding of terms and concepts OR Missing some but it is detailed, creative and shows understanding of terms and concepts.	Missing some output for work and it is not detailed, creative and does not show understanding of terms and concepts.	Missing many pages of output for work and it is not detailed, creative and does not show understanding of terms and concepts.	Missing most/all output for work and it is not detailed, creative and does not show understanding of terms and concepts.		
Station LABs Cell Lab 1 30 points	Lab complete, accurate and shows an understanding of concepts.	Lab complete, fairly accurate and shows understanding of concepts.	Lab incomplete OR is inaccurate and lacks effort and understanding of some concepts.	Lab incomplete AND is inaccurate and lacks effort and understanding of all concepts.	No lab was performed OR very little work was done during this lab.	L 1 2	
Cell Lab 2 30 Points	Student put time, dedication and care into the work on this lab.						

Created by Tara Renner and Brigid Morales 2004

Students at Community Charter Early College High School paste Interactive Notebook guidelines into their composition book on the first day it is introduced. Students also affix a rubric into the notebook, constantly matching their work against an “A” target. Ms. Renner introduced updated rubrics, based on progress and necessary next steps she observes in student work. (These tools can be accessed at www.earlycolleges.org.)

Interactive Science Composition Book

Interactive science composition books are used to help you learn and remember important scientific concepts. Why do they work? This notebook style uses both the right and left-brain hemispheres to help you sort, categorize, remember, and creatively interact with the new knowledge you are gaining.

Guidelines:

1. Every composition book should be organized in the following way: right side for **input** (lecture notes, labs) and the left side for **output** (drawings, reflections). See table below.
2. Pages should be labeled and numbered consecutively with L and R. The left/right pages have the same number but an L or R designation following the page number (i.e., 14L and 14R).
3. Each page should be titled and dated.
4. This Handout Guide should be glued into the front of your composition book.

Left Side (OUTPUT)	Right Side (INPUT)
What goes on the LEFT side? <ul style="list-style-type: none">• OUTPUT• Brainstorming• Concept maps, flow charts, Venn diagrams• Pictures, drawings or diagrams• Poems, songs,• Self reflections• Questions, ideas	What goes on the RIGHT side? <ul style="list-style-type: none">• INPUT• Notes from lectures• Movie notes/questions• Book notes/questions• Labs notes ("in class" labs, mini-labs)• Research Information• Any other type of INPUT you get in class

The importance of the left side:

The left page demonstrates YOUR understanding of the information from the right side page. You work with the input, and INTERACT with the information in creative, unique, and individual ways. The left side helps focus your attention and guides your learning of the science content and concepts. Be creative!

Created by Brigid Morales and Tara Renner 2004

¹ The Interactive Notebook method originated in the TCI/Addison Wesley *History Alive!* curriculum and is now used more widely, especially in social studies.

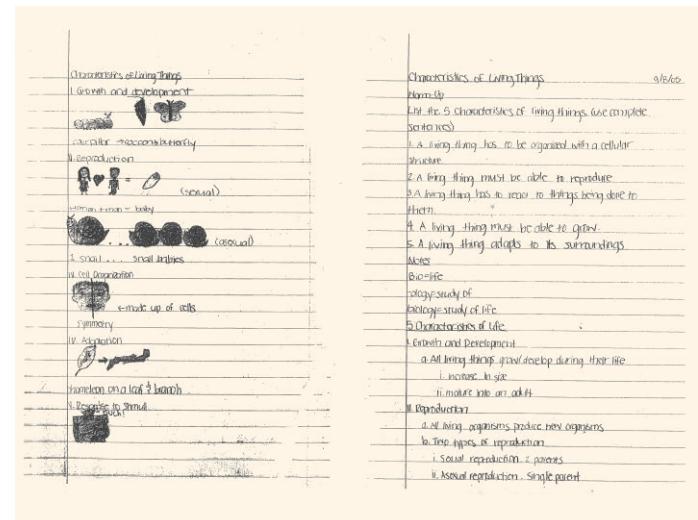
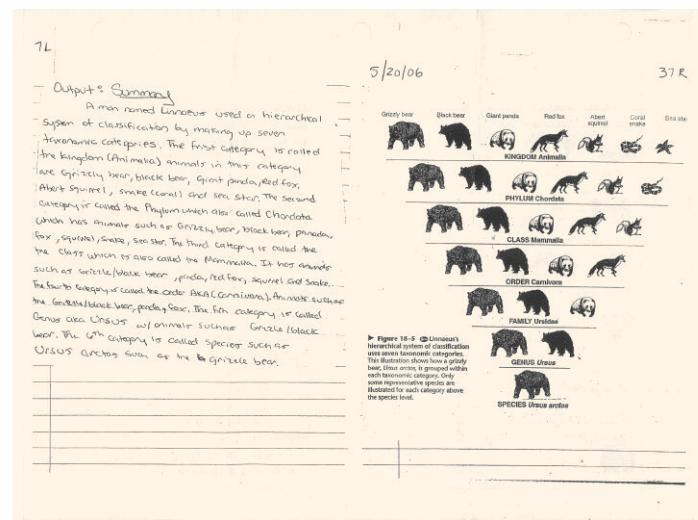
Second: Use the notebook constantly. Students put all of their work in the notebook. They write in it every day, sometimes multiple entries in a single class. Lab notes, lecture notes, warm ups, reviews—all of it goes right in the notebook, and for every “input,” students must produce an “output.” In each entry, students “write to learn,” using the output section to summarize, visually represent, or reflect on and extend the content. Students frequently trade notebooks with a partner, who critiques the entries, and Ms. Renner pushes students further by sharing strong examples with the class and by responding to individuals with comments and questions of her own.

Third: Provide students with choices. For students to “own” their learning, they have to process content in a way that makes sense to them. To become stronger thinkers over time, they must work on new ways of approaching and understanding content. By providing multiple types of output from which to choose, Ms. Renner gets her students to take charge of their thinking processes. They take note of which output methods come most easily; over time, with individualized support, they work on more challenging areas.

Fourth: Use the notebook to guide instruction. When students respond to or represent what they have learned in a new form, their level of understanding rises to the surface—as do misconceptions. The notebook, then, becomes a daily assessment tool for the teacher. Ms. Renner collects the notebooks frequently, writing responses and guiding questions to students. She also looks at student work informally, during class time, to see what they have understood and where they need help. When she notices that the whole class is struggling, she may give a directed assignment or re-teach a lesson with a different approach. When individuals struggle, they work with their partner or the teacher until they get it. In the end, understanding is expected of everyone.

Fifth: Derive summative assessments and projects from students’ notebook writing. The notes never get a chance to get stale, as students constantly refer back to them. Ms. Renner frequently designs warm-up activities and “exit tickets” that require students to look at their most recent notes and recap what they have learned and signal outstanding areas of confusion. At the end of a unit, students go back through their notebook as a study guide, often using it to perform some portion of a final assessment. At the end of a semester or year, Ms. Renner designs culminating “concept map” projects: students map out the connections among at least 70 scientific terms, using their notebooks to review the relationships among topics covered.

Tara Renner entered teaching after working as a field biologist in the Appalachian Mountains of western Maryland and West Virginia. She has taught science for five years, and this is her third year teaching biology at Community Charter Early College High School. Her passions about science include natural resource conservation and environmental stewardship moving us toward a sustainable planet.



After recording or inserting new information into the notebook, students choose how to respond in a way that helps them to clarify their understanding. In the top sample, a student wrote an “output” summary based on a diagram that the class pasted into their “input” page. In the lower sample, a student drew “output” visuals to represent “input” notes the class had recorded. (The diagrams above come from Prentice Hall Biology, by Ken Miller and Joe Levine.)

Community Charter Early College High School

Location: Van Nuys, California

College Partners: California State University Northridge and Mission Community College

Opened: Fall 2004, will serve grades 9-12 at full capacity

Demographics: 209 students; 83% free/reduced lunch; 95% Latino, 2.5% African-American, 2.5% White

Write Like Scientists

It is early in October. A class of tenth graders examines a set of letters and essays they have written about current nuclear issues. A student offers a sample sentence to the class from his partner's essay. "Is that a fact or an opinion?" their teacher asks. "An opinion," the student offers. "That's right, and is this a good place to use an opinion?" the teacher pushes further.

Dr. Ray Pacovsky teaches biology, physiology, and physics at the Alameda Science and Technology Institute in Alameda, California. In all three courses, his driving emphasis is critical thinking and writing, which is unusual for a science class but in line with the priorities of ASTI's faculty. ASTI teachers attribute their students' success on state tests and in college coursework in part to their collective focus on student writing.

Dr. Pacovsky, who was a research scientist, college professor, and author in past lives, puts his own twist on writing in science. Students read current news and magazine articles dealing with science. Then, in response, they write their own reactions, using high-frequency genres of science writing: summaries, letters to the editors, editorials, letters to public officials, persuasive essays, and research reports.

Critical Reading and Writing

Whether or not his students choose to become scientists, Dr. Pacovsky wants them to be critical readers and confident writers, able to understand and respond to scientific information that affects their lives. For each genre of writing, Dr. Pacovsky introduces students to the structures and techniques they can use to communicate their arguments smoothly—and get their own opinions heard by public audiences.

Reading critically and writing cohesive arguments, then, are at the core of Dr. Pacovsky's science curricula. Each week, students read multiple articles on contemporary scientific issues related to the core curriculum of each course. Dr. Pacovsky dedicates over an hour of class time and two homework assignments to mastering the skills needed to analyze and respond to articles. Early on, students learn how to break down the reading into their core elements or features, and then they summarize each piece in a single, coherent paragraph. Students build on these summaries to write more expressive essays, drawing on the authors' arguments to form and articulate their own opinions. By the end of the year, students are writing analytical essays or research project reports in excess of 1,500 words.

Developing Writing Skills

For each type of writing, Dr. Pacovsky apprentices his students in the structures and styles that will give their writing power. Within the first semester, students master the basic structure of each genre, after which they begin to write increasingly sophisticated and precise arguments.

Dr. Pacovsky uses a variety of methods to guide students in developing their writing:

- Show students models of good writing, including samples written by the teacher, examples from the class, and published articles, editorials, and argumentative essays.
- Conduct whole-class critiques of papers, during which students identify the elements of the argument and the author's word-choice decisions.

Features of Each Genre

Summary:

- 1) Author's objective
- 2) Background
- 3) Main point(s)
- 4) Anticipated result(s) or likely conclusion
- 5) Student's opinion

One or two sentences per element. Used to teach paragraph writing.

Editorial:

- 1) Statement of the issue
- 2) Author's point of view
- 3) Analysis of issue (with facts)
- 4) Suggested resolution/call to action
- 5) Anticipated result(s) or likely conclusion

Two or three paragraphs. Used to teach reasoning.

Letter to a Public Figure:

- 1) Statement of the issue
- 2) Personal introduction
- 3) Point of view (with facts)
- 4) Possible outcomes without attention
- 5) Call to action

Two or three paragraphs. Used to teach persuasion.

Letter to the Editor:

- 1) Refer to the article/editorial by its title
- 2) Nature of error or missing information
- 3) Underlying bias of original author
- 4) Alternative point of view
- 5) Persuasive argument
- 6) Anticipated result(s) or likely conclusion

Three or four paragraphs. Used to introduce rhetorical writing.

Rhetorical Essay:

Students take a point of view and develop three reasons in support of that opinion, ranked from strong to strongest. Students write an essay which develops each of the reasons and summarizes the author's thinking.

Five paragraphs. Used as preparation for high school exit exam, SAT II, and college work.

Research Project:

A 1,000-word, five page (minimum) report on a topic taken from the curriculum, the research paper contains three headings in addition to an introduction and conclusion. Facts are drawn from at least five sources, cited in the text, and listed in an MLA-style bibliography. Two research projects are required per semester, one of which is presented to the class via PowerPoint.

- Have students mark up their own writing, identifying a particular element and its effectiveness as a basis for revision.
- Ask student partners to read one another's work, identify effective elements and elements that need further work, and then write letters to one another with suggestions for revision.
- Refine editing skills until students read their own assignments closely as a matter of habit.
- Set individualized weekly goals for students who are still learning English (e.g. writing a clear topic sentence), focusing assessment on mastering those goals.
- Compare science writing to writing in other subject areas, pointing out the attributes common to all persuasive writing and the variations that are typical in science.

Results

In a single year, ASTI students read about 80 popular science articles and write 64 formal responses—in science class alone. As Dr. Pacovsky has noticed, after weeks of focusing on reading, reasoning, and writing, the students' questions in class become more probing and insightful and their writing shows a stronger sense of voice, style, and moral compass. Students also become comfortable with increasingly challenging texts, moving from popular press articles to novels, scientific journals, technical magazines, university science blogs, and professional newsletters.

The confidence ASTI students show as readers and writers is evident in their success on state exams, and Dr. Pacovsky and his colleagues are pleased to see individual students blossom as they leave their fear of writing behind them. In studying pressing contemporary issues and writing to real audiences, students see the immediate impact of their work and power of their voices. The responses students have received from public officials—including California Governor Arnold Schwarzenegger, Congresswoman Nancy Pelosi, Senator Barbara Boxer, U.N. Secretary Kofi Annan, and the White House—further increase that confidence. By the time the students move into college courses as part of their education at ASTI, they are accustomed to the demands of weekly essays. More importantly, students feel empowered as scientists, writers, scholars, and community leaders.

Dr. Ray Pacovsky was a research scientist and college professor before beginning a career as a high school science teacher. While teaching at the University of São Paulo (Brazil), he was recognized for his innovative approach to teaching scientific writing to graduate students across scientific disciplines. In his two years at ASTI, Dr. Pacovsky has taught the sciences, as well as a ninth-grade writing composition course. Currently, Dr. Pacovsky is an adjunct professor at College of Alameda, ASTI's college partner. He has published forty-seven articles and five book chapters on sustainable agriculture, microbial ecology, and biotechnology.

The Alameda Science and Technology Institute

Location: Alameda, California

College Partner: College of Alameda

Opened: Fall 2004, serving grades 9-12

Demographics: 91 students; 38% free/reduced lunch; 50% Asian/Pacific Islander, 16% African-American, 16% White, 13% Latino, 1% Other

Biology 1
2nd period
October 2, 2006

Protection of The Red Legs

One main problem is the death of some of California's jumping frogs. In a recent court case for a frog named Red Leg, a judge sides with the frogs. The Environmental Protection Agency is to research on pesticides that are harming the frogs, many of which are Red Leg Frogs. The Judge said that the EPA is not doing their job by checking the 66 kinds of pesticides that potentially harm the frog. The Red Leg Frog is often associated with our state and that is why people are fighting against their extinction.

Since 1996 The Red Leg has been called endangered. The frogs are down to 10 percent of their original population number and they now only take up three fourths of their natural range. This has been a problem mainly because of agricultural growth.

In order to help these frogs the government has started making habitats for these frogs in local bay area wetlands and waterways in places like Marin, Sonoma, Napa, and other areas.

Although people are trying to protect these frogs, they are surprisingly causing a problem. The problem is that they are in the way of rebuilding a bridge and a dam in the San Mingo Crystal Springs Reservoir. This is the area that the frogs live in and area that they rest. The bridge is sealed off by two lanes in order to stop the public from trespassing or getting into that area. The frogs have been in that area since the late 1990s and they will be hard to move because there is no other areas like this one. This project must be finished and finished soon within the next eight years more specifically, since some beams are showing wear.

I think that it is not good that the EPA has not been doing their job in protecting these iconic frogs, but I am glad that the Judge has finally looked into the case so that it is found for off since

555 Atlantic Avenue
Alameda CA 94501

October 2, 2006

President George Bush
President of the United States of America
The White House
1600 Pennsylvania Avenue
Washington D.C. 20500

Dear President Bush:

Wapusk National Park, near Hudson Bay, is one of the few places where animals such as polar bears, black bears, grizzly bears, moose, red foxes, caribou, beluga whales, and approximately 200 species of bird, among many other animals, can all co-exist together in. Although they live together Global Warming is a threat to their very existence, especially when concerning the polar bears. Hello, my name is Joshua Chow of the Alameda Science and Technology Institute. We at ASTI strive to use knowledge to prepare for the future, including the protection of the environment. Hopefully you may be able to make decisions to help these amazing creatures all located in Wapusk.

Wapusk National Park was created in 1996 and since then less than one hundred visitors have ventured to the area. There are thousands of lakes and ponds in Wapusk and plenty of peat bog, or muskeg, in the area. There are no roads, no trails, no motels, nothing that would attract tourists. Wapusk is 100% natural beautiful environment and amazing creatures. The problem at Wapusk is due to the immense heat caused by global warming.

The polar bears at Wapusk are some of the most southermost in the world. Wapusk is about 2 degrees warmer in wintertime than 50 years ago and the ice is breaking up in early July rather than late July. The bears are having less and less time to feed on seals which is one of their main food sources. Since the bears can't hunt due to melting ice, the lack of nutrition is causing the polar bears to have fewer cubs that survive until adulthood. Every week that the ice is breaking up early, the bears come 20 pounds lighter. The bears have been estimated to have decreased by 15 percent smaller then they were 20 years ago and their population has declined from 1,200 to less then 1,000.

These polar bears are in dire need of help. The United States must take into our thoughts the repercussions of our actions. When people drive, smoke, or eat too much meat, we are all effecting the environment. Please, if there is anything you can do to help these poor creatures it would be of great help and would make my heart lighter. Thank you for taking time out of your busy schedule to read this.

Dr. Pacovsky's Top Sources for Reading Material

- San Francisco Chronicle
- Oakland Tribune
- National Geographic
- Popular Science
- Newsweek
- Scientific American

A summary is the first form of writing Dr. Pacovsky introduces to his students at the Alameda Science and Technology Institute. Students pull out the main points from an article and write succinct paragraphs, ending with their own opinion on the issue, as this student has done in response to an article about red leg frogs. Later, students write letters to public officials, like this letter to the President of the United States.

Web-based Writing

In his four years teaching science to students in the Los Angeles area, Andrew Stephens has asked himself questions like:

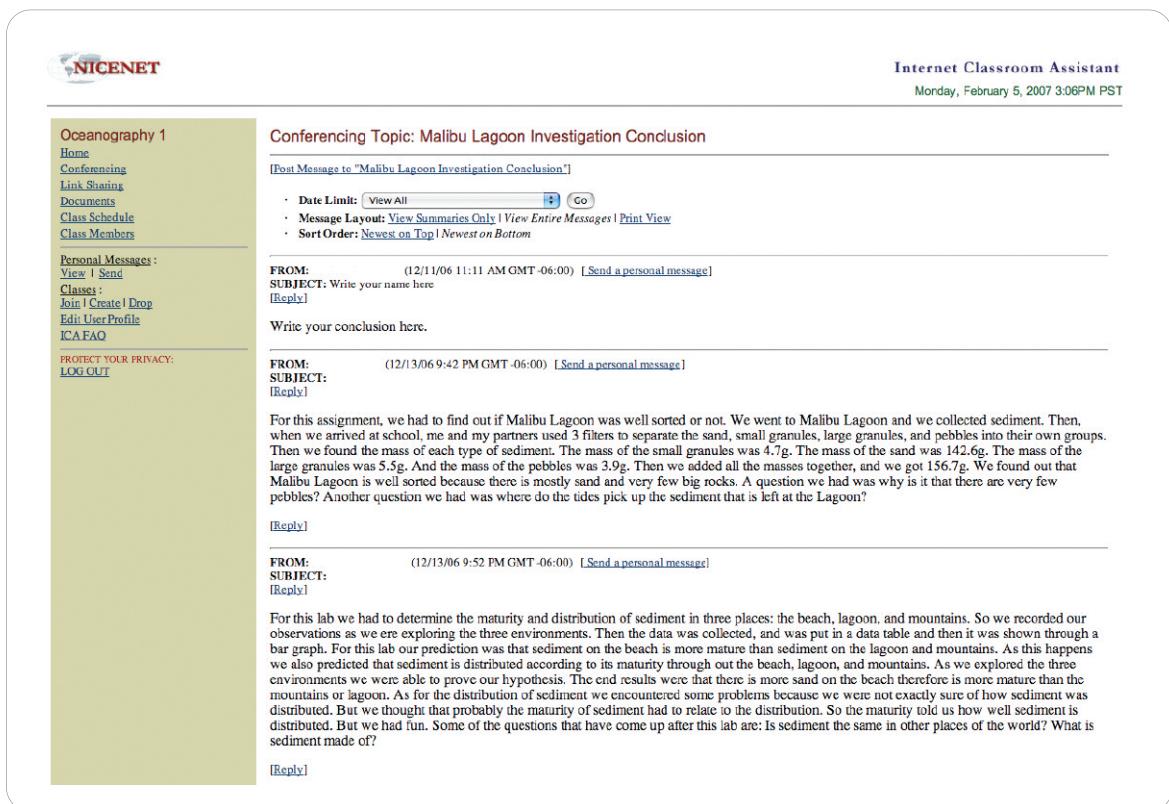
- How do I quickly figure out what my students really understand about the lesson?
- How do I get them to write lab reports and other science assignments better—and without complaining or fear?
- What kinds of everyday activities can help build my students' literacy skills *and* help them with science content?
- How can I do all of this in a way that will save time for me, and for my students?

In the past two years, Mr. Stephens has created a Web-based tool that helps get at all of these questions. He uses technology to make his life easier—and to get his students writing and thinking more deeply about science.

The Web site and newsgroup Mr. Stephens has created for his science classes at California Academy for Liberal Studies Early College High School in downtown Los Angeles are not "add-ons." Rather, technology has become central to the way he teaches science—and he and his students love it.

Mr. Stephens started using Web-based technology as a way of keeping himself and his students organized. By linking much of the course content into his Web page (hosted by California State University,

Mr. Stephens' uses NICENET for brief writing assignments. Students post their responses as individuals or groups, with everyone's writing visible to the class, as shown above.



The screenshot shows a web-based application for "Oceanography 1" on the NICENET platform. The interface includes a sidebar with navigation links like Home, Conferencing, Link Sharing, Documents, Class Schedule, Class Members, Personal Messages, and a privacy link. The main content area is titled "Conferencing Topic: Malibu Lagoon Investigation Conclusion". It shows a message from "Nicenet.org" with a timestamp of 12/11/06 11:11 AM GMT -06:00, a "Send a personal message" link, and a "Reply" link. The message content discusses the investigation of Malibu Lagoon sediment. Below this is another message from "Nicenet.org" at 12/13/06 9:52 PM GMT -06:00, with a "Send a personal message" link and a "Reply" link. The content of this second message is a continuation of the investigation findings.

Northridge), and by asking students to do their informal writing assignments through the class newsgroup format (on nicenet.org), Mr. Stephens is able to keep all of the course content in one place, so that he or any student can go back and look at the class assignments and discussion at any time, from any computer. He has realized that technology is serving more purposes than he initially anticipated. For example, technology is a tool for:

Providing the teacher with a quick check of understanding, simply by asking students to log into the newsgroup in class and answer a prompt. By typing in a one-sentence or multi-paragraph responses, all of the students get a chance to show what they understand from the lesson and post unanswered questions. Their responses pop up on the screen immediately, for the teacher and class to see. Mr. Stephens can look for areas that need further instruction, ask students to help one another out by answering questions through a chat dialogue, or pull out a sample student response for the whole class to examine together.

Increasing student engagement. Mr. Stephens has found that his students are much less shy about "speaking up" when they can do it on the screen; he can elicit more complete responses from even the most reserved or reluctant students. Many of the same students who lack confidence in writing with a pen and paper (and might be complainers in another situation) jump at the opportunity to use a computer and type extended thoughts.

Teaching students the skills of science writing in a format that is approachable and easy to manipulate. Mr. Stephens uses the newsgroup to guide students through the process of writing conclusions to their frequent lab reports, using the RERUN format (R: recall what you did during the lab, E: explain why you did it, R: reflect on the meaning, U: discuss uncertainty and the reliability of your results, N: generate new questions or ideas). This process requires higher order thinking than many students experience in typical science classes; they have to connect to prior knowledge, analyze results, conclude whether a hypothesis is supported by data, and generate new questions and ideas. Such writing requires difficult thinking, so Mr. Stephens takes time to have students draft, critique, and revise their conclusions on the newsgroup. As students post first or second drafts, Mr. Stephens scans for a particular example that exemplifies a struggle shared by many students. He projects that response on the board for the whole class to critique against a rubric, and then they revise the response together. After students revise a peers' conclusion together, they can use that experience as they make similar revisions to their own writing.

Helping students become more adept at navigating computer technology. Mr. Stephens starts the year with basic instruction on word processing, Internet searches, and other everyday computer functions. While some students are advanced computer users, others need instruction and follow-up practice. All of the students benefit from learning computer-based graphing and advanced research skills that are used by scientists and will come in handy in college.

Increasing the amount students write. In a school with a large percentage of English language learners, frequent, low-stakes writing builds fluency and confidence. In writing often, students practice new science vocabulary and see how others use the same words.

Saving time. Mr. Stephens can post an assignment on the newsgroup for the whole class without waiting for the photocopy machine. Also, he can check student work whether he's at school or at home, typing in quick responses, without carrying around bundles of notebooks. All of the student work remains stored on the newsgroup as a record of their learning for the year.

Though Mr. Stephens, like many teachers, cannot provide every student with a computer every day, he takes advantage of a shared set of laptops when he can. He stresses newsgroup writing on some

www.csun.edu/~aes15831

Links from Mr. Stephens

Oceanography

- [Bridge - Ocean Sciences Education Teacher Resource Center](#)
- [Education and Ocean-Coastal Information Resources](#)
- [Exercises for Intro to Oceanography](#)
- [Introductory Oceanography 9E](#)
- [OceanGLOBE • Welcome](#)
- [UCLA-SSWIMS-PowerPoints](#)

Physics

- [HyperPhysics-Great videos](#)
- [Physics Quests- Online Physics Investigations](#)
- [Physics Section-The Worsley School](#)
- [Physics Sing-along - Listen-along](#)
- [Static Magnet Therapy Webquest Home](#)
- [Waves and Sound](#)
- [Podcast.net - The Podcast Directory-Science](#)
- [RubiStar Home-Making Rubrics](#)
- [Science Branch-LAUSD](#)
- [Search Results, Federal Resources for Educational Excellence \(FREE\)](#)
- [Tapped In Home](#)

days; on other days, he places more emphasis on writing in interactive notebooks (pen and paper). Even using the newsgroup twice a week helps, as students are writing more, and writing more effectively, than they were before.

Andy Stephens comes from a background in the social sciences and began teaching science at Community Charter Middle School in Los Angeles in 2003—and he got hooked. He has been teaching in the Partnerships to Uplift Communities charter school network ever since, and has become an avid science scholar and environmentalist. Mr. Stephens founded and advises the Mean Green Team, an environmental activism club at CALS Early College High School. His school Web site showcases the accomplishments of the Mean Green Team, as well as artifacts from his own scientific explorations.

California Academy for Liberal Studies Early College High School

Location: Los Angeles, California

College Partner: Los Angeles Trade and Technical College

Opened: Fall 2003, serves grades 9-12

Demographics: 284 students; 82% free/reduced lunch; 97% Latino, 1% White, 0.4% African-American, .4% Asian, 0.7% Other

Final Thoughts

The ultimate goal of early college high schools is college success. Teachers in early college high schools, therefore, must think constantly about building bridges between where their students are now and the content and skills that will be demanded—very soon—when they take college courses. Literacy instruction can be a key vehicle for increasing rigor, while supporting student development of essential skills.

As the featured teachers demonstrate, integrating literacy skills in the science classroom does not mean adding reading and writing instruction to an already full curriculum. It means working smart. The teachers have thought quite intentionally about the literacy skills that are important in the sciences and the types of activities that help students to master science concepts. As a result, teachers find they increase student growth in two areas at once:

- Students become more adept at handling the reading, writing, and thinking tasks at the heart of the sciences—which will be essential for their success in college science courses.
- Students acquire a deeper, more flexible understanding of science content by learning tools for reading actively, manipulating new content, and articulating their thinking in writing.

Best of all, these “two-for” instruction strategies aren’t limited to the sciences. The methods developed by Ms. Renner, Dr. Pacovsky, and Mr. Stephens can be used in any subject area to deliver the rigor *plus* support that is needed for every student to attain college success.

Some Questions to Consider

What types of reading and writing skills are essential to the discipline you teach?

What literacy skills will your students need to be successful in entry-level college courses in your discipline?

What types of texts do real scientists, historians, political analysts, statisticians, etc., read and write?

How do the members of that discipline read? Do they skim for information, dig into arguments to find their flaws, use signal words to understand an author’s logic?

How do the members of that discipline write? What are the conventions for making an effective argument? What writing techniques and word choices make an argument stand out?

Do your students demonstrate understanding of key concepts and ideas? How might you integrate more opportunities for students to reflect and write about what they are learning?

Resources for Teachers

The tools on page 2 are available at www.earlycolleges.org/library.html.

Allen, Janet. 2004. *Tools for Teaching Content Literacy*. Portland, ME: Stenhouse.

Daniels, Harvey. 2004. *Subjects Matter: Every Teacher’s Guide to Content-Area Reading*. Portsmouth, NH: Heinemann.

Fisher, Douglas and Nancy Frey. 2004. *Improving Adolescent Literacy: Strategies at Work*. Upper Saddle River, NJ: Pearson.

Harvey, Stephanie. 2000. *Teaching Comprehension to Enhance Understanding*. Portland, ME: Stenhouse.

“Tools for Reading, Writing, and Thinking.” School District of Greece, NY. Web site: <http://www.greece.k12.ny.us/instruction/ela/6-12/Tools/Index.htm>.

Tovani, Chris. 2004. *Do I Really Have to Teach Reading: Content Comprehension, Grades 6-12*. Portland, ME: Stenhouse.

Urquhart, Vicki and Monette McIver. 2005. *Teaching Writing in the Content Areas*. Alexandria, VA: ASCD.



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